

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
28 February 2002 (28.02.2002)

PCT

(10) International Publication Number  
**WO 02/16210 A1**

(51) International Patent Classification<sup>7</sup>: **B65B 59/00**,  
57/10, 35/24

(21) International Application Number: PCT/NZ01/00169

(22) International Filing Date: 22 August 2001 (22.08.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
506489 22 August 2000 (22.08.2000) NZ

(71) Applicant (for all designated States except US): **SEALED  
AIR (NZ) LIMITED** [NZ/NZ]; Corner of Avalon Drive  
and Foreman Road, Hamilton (NZ).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **KOKE, John,  
Paul**, [NZ/NZ]; 32 Thirwall Lane, RD3, Cambridge (NZ).  
**STEELE, Clifford, Bruce**, [NZ/NZ]; 14 Sorrel Crescent,  
Bucklands Beach, Auckland (NZ).

(74) Agents: **CALHOUN, Douglas, C. et al.**; A J Park, 6th  
floor, Huddart Parker Building, P.O. Square, P.O. Box 949,  
Wellington 6015 (NZ).

(81) Designated States (national): AE, AG, AL, AM, AT, AU,  
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,  
CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,  
GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,  
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,  
MX, MZ, NO, NZ, PH, PL, PT, RO, RU, SD, SE, SG, SI,  
SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU,  
ZA, ZW.

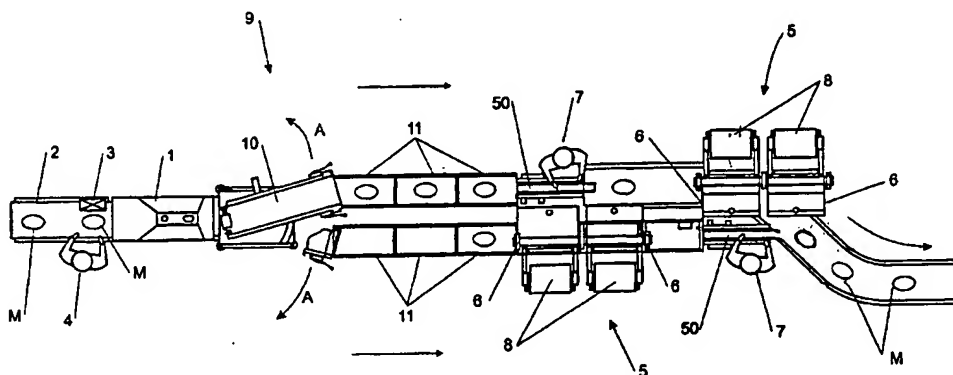
(84) Designated States (regional): ARIPO patent (GH, GM,  
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian  
patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European  
patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE,  
IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF,  
CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD,  
TG).

**Published:**

- with international search report
- before the expiration of the time limit for amending the  
claims and to be republished in the event of receipt of  
amendments

For two-letter codes and other abbreviations, refer to the "Guid-  
ance Notes on Codes and Abbreviations" appearing at the begin-  
ning of each regular issue of the PCT Gazette.

(54) Title: APPARATUS AND METHOD FOR USE IN PACKING MEAT CUTS



WO 02/16210 A1

(57) Abstract: Apparatus for use in packing meat cuts (M) including a machine vision (26) system arranged to scan or view indi-  
vidual meat cuts (M) and acquire dimensional, volume, shape or type, or meat quality or grading information or other information  
relating to the individual meat cuts (M), two or more meat cut packing stations (5) arranged to receive the acquired information  
relating to individual meat cuts (M) and to dispense to an operator or automatically apply to the meat cuts (M) a pack matched to each  
individual meat cut (M) as meat cuts arrive at the packing stations (5), and a diversion stage (9) arranged to direct individual meat  
cuts (M) to one or other of the packing stations (5) based on the acquired information relating to the individual meat cuts (M) from  
the machine vision system (26).

## APPARATUS & METHOD FOR USE IN PACKING MEAT CUTS

### FIELD OF INVENTION

The invention relates to the packing of meat cuts and typically primal red meat cuts on a packing line in a meat processing plant.

### BACKGROUND

Typically in a meat processing plant carcasses are butchered to primal meat cuts which are then individually packed in bags or boxes manually by operators from a packing line.

Various equipment for automating parts of the packing process are known.

### SUMMARY OF INVENTION

The invention provides an improved or at least alternative form of apparatus and method for use in packing meat cuts.

In broad terms in one aspect the invention comprises apparatus for use in packing meat cuts, which includes:

a meat cut information acquisition stage arranged to acquire information relating to one or more characteristics of individual meat cuts passing the meat cut information stage,

two or more meat cut packing stations, and

a diversion stage between the meat cut information acquisition stage and the meat cut packing stations, arranged to direct individual meat cuts to one or other of the two or more packing stations based on information relating to the individual meat cuts acquired at the meat cut acquisition stage.

One or more of the packing station(s) is typically arranged to provide a different size or sizes or type(s) of pack from one or more other packing station(s).

Preferably one or more packing station(s) is arranged to receive information relating to individual meat cuts as they leave the meat cut information acquisition stage or move between or arrive at the packing station(s), or instructions associated with individual meat cuts from a control system, and to dispense to an operator or automatically apply to the meat cuts a pack matched to each individual meat cut arriving at the packing station.

In one configuration one or more packing station(s) may be arranged to dispense or apply larger packs and one or more other packing station(s) may be arranged to dispense or apply smaller packs, and a control system and the diversion means may be arranged to divert larger meat cuts to one or more packing station(s) and smaller meat cuts to other packing station(s). For example one or more packing stations may be arranged to dispense or apply packs of greater width and one or more other packing station(s) may be arranged to dispense or apply packs of lesser width. In addition where the packs are plastic bags the bags may be of standard lengths or alternatively one or more packing stations may also be arranged to manufacture and dispense or apply bags in different lengths from continuous bag stock, by dispensing lengths of bag stock, and cutting and heat sealing one end of the bag stock to form the bags of tailored length, based on information relating to individual meat cuts acquired at the meat cut information acquisition stage.

Alternatively again one or more packing stations may be arranged to dispense packing material for wrapping and sealing meat cuts, in standard lengths, or in different lengths from continuous stock by cutting the packing material to length for each meat cut based on information relating to individual meat cuts acquired at the meat cut information acquisition stage. Alternatively again one or more packing stations may be arranged to wrap and seal flat packing material around the series of meat cuts passing through the packing station and to form a heat seal between every two meat cuts and a cut to separate the packed meat cuts.

In another configuration one or more packing stations may be arranged to dispense or apply packs of one type and one or more other packing station(s) may be arranged to dispense or

apply packs of another type, and a control system and the diversion means may be arranged to divert meat cuts to a packing station which dispenses a predetermined pack type. For example different packing stations may dispense or apply high oxygen barrier packs, export quality packs, high puncture resistance packs for bone-in meat cuts, packs preprinted for different cut types or meat quality or gradings, or packs which are branded or otherwise pre-prepared in accordance with end-user specifications of customers for the meat cuts. These are examples and various user selected configurations and arrangements are possible.

In one form one or more packing station(s) may be arranged to dispense to an operator a number of different sizes or types of pack at the same packing station, and in this configuration preferably a control system is arranged to cause a single pack matched to each individual meat cut to be dispensed as each meat cut arrives at the packing station.

The acquired information relating to individual meat cuts may include for each meat cut any one or more of dimensional information such as length information, width information, or length and width information, volume or shape information, meat cut type information, and meat quality or grading information, or any other information relating to the meat cuts. Information acquired at the meat cut information acquisition stage optionally may be supplemented by weight information and/or information on individual meat cuts visually assessed by an operator and manually input into the system as each meat cut passes the operator. For example in one form the acquired information for each meat cut may include dimensional information or volume or shape information, and optionally weight information, and an operator may visually assess the meat cuts as to meat cut type and meat quality or grade. A manual input means may enable manual input by the operator to a control system of meat cut type information and/or meat quality or grading information.

Printing means may be associated with one or more packing stations and arranged to print on packs dispensed for or applied to individual meat cuts, as they arrive at the packing station, information indicative of one or more of the meat cut's weight, cut type, a processing or other date, carcass identification information, or other information relating to the meat cuts.

In a preferred form the diversion stage comprises a conveyor or chute arranged to swing about an axis to deliver individual meat cuts to one of two or more downstream conveyors to two or more meat cut packing stations or directly to the two or more packing stations.

In broad terms in another aspect the invention comprises a method for use in packing meat cuts, including:

acquiring information relating to one or more characteristics of individual meat cuts as the meat cuts are conveyed past a meat cut information acquisition stage, and

at a subsequent diversion stage in a conveyor system directing each of the individual meat cuts to one of two or more alternative packing stations based on the information relating to individual meat cuts acquired at the meat cut acquisition stage.

In another aspect the invention comprises a bagging apparatus for use in placing products in bags, including a conveyor on which a product may be supported while a bag is placed over the product and either means arranged to detect when the product is in the bag and arranged to then activate the conveyor to move the product and bag from the bagging apparatus, or means which may be manually activated via the bag by an operator to activate the conveyor to move the product and bag from the bagging apparatus.

In a preferred form a physically activated microswitch or similar is arranged to be contacted by the bag once the bag has been placed over the product, either manually by an operator or by an automatic bagging machine, and which then activates the conveyor on which the product is supported to eject the bagged product from the bagging apparatus or move the bagged product onto the next processing stage. Alternatively however a non-contact arrangement for detecting when the product is within the bag may be provided, such as a light beam which is broken when the bag is over the product or a more sophisticated machine vision system or similar.

## BRIEF DESCRIPTION OF THE FIGURES

The invention is further described with reference to the accompanying figures which show preferred forms of apparatus of the invention by way of example and without intending to be limiting, and wherein:

Fig 1 is a plan view of a first preferred form of apparatus of the invention,

Fig 2 is a side view of a preferred form apparatus of the invention similar but not identical to that of Fig 1,

Fig 3 is a plan view of another preferred form apparatus of the invention,

Figs 4A to 4C schematically show the operation of a preferred form bagging apparatus of the invention,

Fig 5 is a side view of a preferred form bagging apparatus,

Fig 6 is a transverse cross-section view of the preferred form bagging apparatus of Fig 5, and

Fig 7 is a plan part-sectional view of the end of the preferred form bagging apparatus.

## DETAILED DESCRIPTION OF PREFERRED FORMS

Referring to Figures 1 and 2 (noting that the side view of Figure 2 is of preferred form apparatus similar but not identical in layout to the apparatus shown in Fig 1), the preferred form apparatus comprises a meat cut information acquisition stage 1 which is preferably a machine vision system beneath which individual meat cuts M pass along conveyor 2. The machine vision system acquires information relating to one or more characteristics of individual meat cuts passing through the machine vision stage 1 on conveyor 2. As a minimum the machine vision system 1 may acquire simple dimensional relating to the individual meat cuts such as only one of the length or width or another single dimension of

each meat cut. More preferably the machine vision system is set up to acquire further dimensional information such as the size of the meat cuts or the volume or shape of the meat cuts. Information as to the weight of each meat cut may be acquired additional to the dimensional or volume or shape information, for example by a weighing conveyor before or after the machine vision stage which weighs the individual meat cuts and passes the weight information to a control system along with the dimensional and/or volume or shape information.

The meat cut information acquisition stage may comprise a digital camera system which "sees" individual meat cuts and/or a system which directs at least one beam or line from a scanning laser over individual meat cuts on the conveyor 2. Referring to Figure 2, in a preferred form a scanning laser 25 directs a beam over moving meat cuts passing through the machine vision stage and deflection and/or reflection of laser light on the meat cut is seen by a camera system 26, and the resulting information is processed to provide the dimensional and/or volume or shape information in relation to each meat cut. Alternatively the machine vision system may simply be a series of horizontal and vertical beams across the conveyor path at different heights or spacings through which the meat cuts pass, providing information to a control system as to the width and/or height and/or length of the meat cuts based on the number of beams broken by each passing meat cut. Any other machine vision system which enables the acquisition of information as to one or more of cut length, width, size, volume, shape or similar of the meat cuts may be used.

The acquired information may be supplied direct to individual electronic or programmed controllers for the diversion stage and the packing stations but is more preferably supplied to a common control system which controls the diversion stage, packing stations, and synchronises the arrival of individual meat cuts with the dispensing or applying of individual packs to the meat cuts at each packing station.

In addition the machine vision system 1, or a separate machine vision system, may be arranged to view the meat cuts to provide information to a control system as to the meat cut type eg whether the meat cut is a boneless or bone-in cut, or as to the cut type eg rump, tenderloin etc. or other information relating to the meat cuts. Alternatively information as to

the meat cut type and/or meat quality or grading information may be manually input by an operator for example via a touch screen 3 as shown in Figures 1 and 2, mounted adjacent the machine vision stage 1. In this configuration as shown an operator such as that indicated at 4 views each meat cut M as it passes the operator towards the machine vision stage 1 on conveyor 2, and enters into the touch screen 3 for each cut as it passes, the cut type and/or meat quality or grading or other information as visually assessed by the operator.

The apparatus comprises two or more packing stations generally indicated at 5 in the drawings. In the preferred forms shown in the drawings the apparatus comprises two meat cut packing stations but a diversion stage may be arranged to divert meat cuts between three or more packing stations or between two or more packing stations and another processing stage. For example in one configuration the diversion stage may be arranged to divert individual meat cuts between an automated packing station for meat cuts within a certain standard size range or of a certain type, a manual packing station for other meat cuts, and a reject path for meat cuts which are assessed manually by an operator or by the machine vision stage as being non-standard in some respect.

In the form shown, at each of the packing stations is provided one or more bag dispensers 6 which dispense plastic bags to operators such as those indicated at 7. The bag dispensers may be of known form and typically plastic bags are dispensed from rolls of bag stock 8 carried by each bag dispensers 6, or alternatively stacks of bags or any other bulk bag supply.

Alternatively one or more of the packing stations may be arranged to automatically pack meat cuts. For example an automated packing station may be arranged to dispense and insert or drop the meat cuts into plastic bags, and onforward each packed meat cut. Another form of automated packing station may be arranged to wrap a continuous section of packing material around a series of meat cuts passing through the packing station on a conveyor, and then seal the packing material around the meat cuts and cut the individual packed meat cuts from the continuous series. Again various arrangements of automated packing station may be employed.



A diversion stage 9 between the machine vision stage 1 and the meat cut packing stations 5 directs each individual meat cut M to a preselected one of the packing stations 5. In the preferred form the diversion stage comprises a belt conveyor 10 which is arranged to swing about an axis, as indicated by arrows A in Fig 1, to direct individual meat cuts to one or other of the packing stations 5. In the preferred form the belt conveyor 10 is supported for the pivoting swing movement about a generally vertical axis by a sub-frame 11 which includes an associated pneumatic or electric drive system 12 for driving the side to side movement of the diversion conveyor 9 under control of a central control system (or alternatively the diversion conveyor may receive direction commands direct from the machine vision stage 1). The diversion stage 9 may alternatively comprise any other form of conveyor arranged to move horizontally, vertically or with any other motion between the meat cut packing stations or onward conveyors to the two or more meat cut packing stations. Alternatively the diversion stage could comprise a chute for example, down which the meat cuts move and the delivery end of which is arranged to move to deliver the individual meat cuts to the selected packing stations for each meat cut. Alternatively again the diversion stage could comprise a flipper system arranged to flip individual meat cuts from the conveyor of the diversion stage on to two or more onward conveyors taking the meat cuts to two or more different packing stations or similar. Instead of a single diverter the diversion stage could comprise two or more stages of diverters in series arranged to divert the meat cuts across a first and then second series of conveyors to packing stations and optionally other processing stages.

Different packing stations may be arranged to dispense or apply plastic packs of one or more different sizes, or different types such as packs having different oxygen barrier properties, different degrees of bone puncture resistance, packs preprinted with or different quality or grading markings or colours for different types or grades of meat cut, or packs which are branded or otherwise specified differently to meet end user specifications of customers for the meat cuts. Different packing stations may be supplied with bag or pack stock of different sizes, such as rolled tubular bag stock as indicated at 8, and the control system may be arranged to direct different meat cuts to different packing stations. Three or four or more packing stations dispensing or applying different sizes or types of packs are possible.

In one configuration different dispensers at different packing stations may be supplied with continuous tubular bag stock of different widths and bags may be manufactured to length by heat sealing and cutting lengths of the tubular stock at the time of dispensing. Bags may be pre-cut or may be manufactured at the bag dispenser(s) to a standard length for the bag stock width, or alternatively one or more of the bag dispenser(s) may receive information from a control system as to the dimensions, volume, shape, weight etc of individual meat cuts and may manufacture bags to individual lengths or to one of a range of lengths for that bag stock width, sized to each individual meat cut. Either a control system may provide to a packing station or bag dispenser controller information as the size, shape, weight or type of each individual meat cut as that meat cut is machine viewed and moves to or arrives at the packing station, or a control system may process the acquired information in relation to each cut and provide a simple command to each packing station as to the length or size or type of bag or wrap to dispense or apply to each meat cut.

In a further configuration one or more packing stations may each be arranged to deliver bags of two or more sizes or types, for example by providing two or more bag dispensers 6 at one or more packing stations. Where multiple pack dispensers are provided at a manual packing station an operator may simply manually select the desired bag or pack size or type which the operator judges most appropriate for each meat cut arriving at the packing station, but more preferably one and only one bag or pack size or type is dispensed to an operator for each meat cut, which the system selects based on the acquired information in relation to each approaching meat cut. As only a single bag or pack is automatically dispensed for each meat cut arriving at the packing station, errors in operator choice of the appropriate pack are avoided.

In the preferred form a queuing conveyor consisting of individual queue conveyor stages 11 in series is provided between the diversion stage 9 and the packing stations 5 to queue individual meat cuts while awaiting packing at a particular packing station if meat cuts are diverted to that packing station faster than an operator can pack them over any short period. Operation of the queuing conveyor stages is controlled by a central control system so that arrival of an individual meat cut at a packing station is synchronised with acquired

information relating to that meat cut. In the preferred form each queuing conveyor is mounted on a sub-frame 13 and includes drive motor 14.

The apparatus layouts shown in Figures 1 to 3 are simply examples and multiple manual and/or automated packing stations optionally combined with other processing stations may be provided in any desired configuration, such as for example a star configuration with the diversion stage at the hub or similar, or any other desired configuration for a particular meat processing plant.

To synchronise the arrival of individual meat cuts at a packing station with the acquired information relating to the individual meat cuts or pack dispense commands from a control system, a central control system may count the number of meat cuts passing the machine vision stage, store information on the packing station to which each meat cut is directed by the diversion stage, and count and store the number of packs provided at each packing station. Thus a control system may match the nth bag dispensed or applied at a packing station to the nth meat cut directed to that packing station. The system may have a "repeat facility" for manual packing stations whereby an operator may for example hit a button if a dispensed bag or wrap is damaged as it is withdrawn from the dispenser, to cause the dispenser to dispense another identical bag or wrap without affecting the pack count used to synchronise pack dispensing operations with arrival of the meat cuts at the packing station. In another arrangement acquired information relating to each meat cut may be sent directly from the machine vision stage to the packing station or bag dispensing controller at the packing station to which the meat cut is directed, and is retained in a database at the packing station until that meat cut has arrived, and is then used to dispense or apply the appropriate bag or wrap for that meat cut. Again the nth pack provided at that packing station would be synchronised with the nth meat cut directed to the packing station. In a yet more sophisticated arrangement individual meat cuts may be tracked through the apparatus along the conveyors so that the system can detect if any individual meat cut is removed from the product stream for any reason, to again avoid mis-indexing of the meat cuts and packs this may be achieved by detecting and tracking the movement of each meat cut from one conveyor to the next. Again various arrangements are possible.

The individual bag dispensers or packing stations may include associated printing means such as a print head arranged to print information on individual bags or wraps for individual meat cuts as the packs are dispensed or applied, such as information as to the meat cut weight, cut type, processing or other date, carcass identification information ie identifying the supplier to the meat processing plant of the animal from which the meat cut has been obtained, and/or the individual carcass, or other information relating to the meat cut(s). In one arrangement, each meat cut may at an earlier processing stage be tagged with a physical tag such as a stick-in tag carrying carcass identification information such as a bar code, and rf tag, or other machine readable code identifying the supplier of the meat cut. This code may be read by a reader before or after the machine vision stage or as the meat cut approaches a packing station to provide the carcass identification information or other information relating to the meat cut to the print system.

Fig 3 shows a preferred form of apparatus of the invention generally similar to that of Figs 1 and 2, and in Fig 3 like reference numbers as in Figs 1 and 2 indicate like components. In the apparatus of Fig 3 diversion stage 9 directs individual meat cuts to a manual packing station generally indicated at 15 or an automated bagging or wrapping and sealing station generally indicated at 16 which is arranged to automatically place meat cuts into bags or wrap or seal or otherwise pack the meat cuts, and then send the meat cuts down conveyor 17. Alternatively the diversion conveyor may direct to outlet 18 meat cuts outside of a size range able to be handled at packing stations 15 or 16, or which are rejected or otherwise considered non-standard for any reason. Such meat cuts may be delivered from outlet 18 to another conveyor or any further processing stage for further handling. Packed meat cuts exiting the manual and automated packing stages 15 and 16 on conveyors 17 and 19 are merged at conveyor 20 and delivered to any further processing stage such as vacuuming, shrinking, boxing, chilling, or similar.

The preferred form apparatus of the invention described above may also include as indicated at 50 in Figs 1 and 3 a preferred form of bagging apparatus to assist operators in manually placing bags over the meat cuts when packing the meat cuts in bags, or to assist an automatic bagging machine in placing bags over the meat cuts or the meat cuts into the bags. Figures 4A to 4C schematically show the operation of the preferred form bagging apparatus. The

apparatus comprises a short conveyor or conveyor table 50 or series of two or three adjacent parallel conveyors onto which meat cuts arrive at the packing station 5 as shown in Fig 4A. Typically during ejection of the previously packed meat cut by the conveyor(s) 50 the same movement of the conveyor brings forward the next meat cut. An operator brings a bag B dispensed to the operator at the packing station as described above, over the meat cut M on the stationary conveyor 50 as shown in Fig 4B. In one form placement of the bag B on the meat cut M contacts bar 51 extending along the forward end of the conveyor table which in turn activates conveyor 50 to eject the now bagged product from the packing station as illustrated in Fig 4C. When pressure is applied to the bar 51 by the bottom of a bag brought home over the meat cut M as shown in Fig 4B a microswitch or proximity sensor may be triggered. Any other arrangement which will activate the conveyors 50 to eject the bagged meat cut from the packing station once the bag is placed over the meat cut may be utilised, such as a light beam arranged to be broken when the bag is home on the product or any other form of electronic or non-physical or mechanical sensor.

Figures 5 to 7 show in more detail one preferred form of bagging apparatus. Conveyor 50 moves around table 52. When a meat cut arrives at the packing station it moves on to the then stationary conveyor 50. A mechanical trigger system consists of two independent trigger bars 53 on either side of the table 52 shaped as shown, and which are guided at their forward ends in slots 54 in the forward end of the table 52. The trigger bar is mounted for pivotal movement in the direction of arrow C in Figs 5 and 6 about axle members 55 which are journaled in the table 52 as shown. When a bag is brought over the forward end of the table 52 and conveyor 50, (to the position shown in Fig 4B), and the bag is pulled upwardly slightly, upward pressure of the underside of the bag will deflect upwardly one or other of the trigger bars 53 which closes electrical switches or triggers proximity sensors 56 which in turn activates the conveyor 50 to eject the bagged product (and bring forward the next meat cut). An advantage of this arrangement is that the operator has control of the timing of the ejection of the bag product from the bagging conveyor since ejection is activated by the operator pulling upwardly slightly on the bag as the operator brings the bag fully home over the meat cut on the conveyor 50.

In one preferred configuration the convey 50 and table 52 may consist of two or three adjacent parallel conveyors – a larger bag for a large meat cut is then slid over all three conveyor “fingers”, a mid-size bag may be slid over only two conveyor “fingers”, with at one point the bag sliding between the middle finger and an outer finger, and a smaller bag for a smaller meat cut may be slid over only a single conveyor.

The foregoing describes the invention including preferred forms thereof. Alterations and modifications as will be obvious to those skilled in the art are intended to be incorporated in the scope hereof as defined in the accompanying claims.

**CLAIMS:**

1. Apparatus for use in packing meat cuts, which includes:

a meat cut information acquisition stage arranged to acquire information relating to one or more characteristics of the individual meat cuts passing the meat cut information acquisition stage,

two or more meat cut packing stations, and

a diversion stage between the meat cut information acquisition stage and the meat cut packing stations, arranged to direct individual meat cuts to one or other of the two or more packing stations based on information relating to the individual meat cuts from the meat cut acquisition stage.

2. Apparatus according to claim 1 wherein one or more packing station(s) is arranged to provide a different size(s) or type(s) of pack from one or more other packing station(s).
3. Apparatus according to claim 1 wherein one or more packing stations is arranged to receive acquired information relating to individual meat cuts as they leave the meat cut information acquisition stage or more between or arrive at the packing station(s), or instructions associated with individual meat cuts from a control system, and to dispense to an operator or automatically apply to the meat cuts a pack matched to each individual meat cut arriving at the packing station.
4. Apparatus according to claim 3 wherein one or more packing station(s) is arranged to dispense or apply larger packs and one or more other packing station(s) is arranged to dispense or apply smaller packs, and a control system and the diversion means are arranged to divert larger meat cuts to the one or more packing station(s) arranged to dispense or apply larger packs and smaller meat cuts to the one or more packing stations arranged to dispense or apply smaller packs.

5. Apparatus according to either one of claims 3 and 4 wherein one or more packing station(s) is arranged to dispense or apply packs of one or more different types from one or more other packing station(s), and a control system and the diversion means are arranged to divert some meat cuts to the packing station(s) dispensing or applying packs of one or more types and other meat cuts to the packing station(s) dispensing or applying packs of another pack type.
6. Apparatus according to any one of claims 1 to 5 wherein the packing stations are arranged to dispense or apply plastic bags.
7. Apparatus according to claim 4 wherein the packing station(s) arranged to dispense or apply larger packs is or are arranged to dispense or apply plastic packs of greater width and the one or more packing stations arranged to dispense or apply smaller packs is or are arranged to dispense or apply plastic packs of a lesser width.
8. Apparatus according to either one of claims 4 to 7 wherein one or more packing station(s) is arranged to manufacture and dispense or apply plastic packs in different lengths from continuous packing material stock based on information relating to individual meat cuts acquired at the meat cut information acquisition stage.
9. Apparatus according to any one of claims 4 to 8 wherein at least one packing station(s) is arranged to dispense or apply a number of different sizes or types of pack and a control system is arranged to cause the packing station to dispense or apply a single pack matched to each individual meat cut as each meat cut arrives at the packing station.
10. Apparatus according to any one of claims 1 to 9 wherein the acquired information relating to individual meat cuts includes any one or more of dimensional information, volume information, or shape information, meat cut type information, meat quality or grading information, or other information relating to the meat cuts.



11. Apparatus according to any one of claims 1 to 9 wherein the acquired information relating to individual meat cuts includes any of dimensional information, volume information, or shape information, and a manual input means enables manual input by an operator to a control system of meat cut type information, meat quality or grading information or other information relating to the meat cuts.
12. Apparatus according to any one of claims 1 to 11 wherein one or more packing stations include associated printing means arranged to print on packs or pack material dispensed or applied for individual meat cuts information indicative of one or more of meat cut weight, cut type, a processing or other date, carcass identification information, or other information relating to the meat cuts.
13. Apparatus according to any one of claims 1 to 12 wherein the meat cut information acquisition stage comprises a camera based machine vision system.
14. Apparatus according to any one of claims 1 to 13 wherein the meat cut information acquisition stage comprises a machine vision system including at least one beam which scans the meat cuts or through which the meat cuts pass to acquire information relating to the individual meat cuts.
15. Apparatus according to any one of claims 1 to 14 wherein the diversion stage comprises a conveyor or chute arranged to swing about an axis to deliver individual meat cuts to one of two or more downstream conveyors to two or more packing stations or directly to one of two or more packing stations.
16. Apparatus according to claim 15 wherein the diversion conveyor is mounted on a sub-frame for pivoting movement about a generally vertical or horizontal axis and includes an associated drive system for driving the pivotal movement of the diversion conveyor when activated by a control system.
17. Apparatus according to any one of claims 1 to 16 including a queuing conveyor or conveyors between the diversion stage and one or more of the packing stations, which

queuing conveyor or conveyors is or are arranged to queue individual meat cuts before the packing station(s) to which the individual meat cuts have been directed by the diversion stage.

18. Apparatus according to claim 17 wherein the queuing conveyor(s) comprise(s) a number of individual queuing conveyor stages in series.
19. Apparatus according to any one of claims 1 to 18 including an in-line weigh station for weighing meat cuts as they pass over the weigh station.
20. Apparatus according to any one of claims 1 to 19 including automated packing apparatus arranged to automatically bag individual meat cuts in plastic bags at one or more of the packing stations.
21. Apparatus according to any one of claims 1 to 19 including automated packing apparatus arranged to apply packs to individual meat cuts by automatically wrapping and sealing individual meat cuts in a packing material at one or more of the packing stations.
22. Apparatus according to any one of claims 1 to 21 wherein a control system is arranged to receive at set up by an operator input information as to pack material stock size loaded by the operator onto one or more of the packing station(s).
23. Apparatus according to any one of claims 1 to 21 wherein one or more of the packing stations is arranged to electronically report to a control system information as to the pack material stock size loaded onto the packing station(s) by an operator during set up.
24. Apparatus for use in packing meat cuts, which includes:

a machine vision system arranged to scan or view individual meat cuts passing a meat cut information acquisition stage and acquire dimensional, volume, shape cut type, or meat quality or grading information relating to the individual meat cuts,

at least two meat cut packing stations arranged to receive acquired information relating to individual meat cuts as they leave the meat cut information acquisition stage or move between or arrive at the packing station, or instructions associated with individual meat cuts from a control system, and to dispense to an operator or automatically apply to the meat cuts a pack matched to each individual meat cuts arriving at the packing station, and

a diversion stage between the meat cut information acquisition stage and the meat cut packing stations, under control of a control system associated with, or arranged to receive information from the machine vision system, which diversion stage is arranged to direct individual meat cuts to one or other of the two or more packing stations based on acquired information relating to the individual meat cuts from the meat cut acquisition stage.

25. Apparatus according to claim 24 wherein one or more packing station(s) is arranged to dispense or apply larger packs and one or more other packing station(s) is arranged to dispense or apply smaller packs.
26. Apparatus according to claim 24 wherein one or more packing station(s) is arranged to dispense or apply packs of one or more different types from one or more other packing station(s).
27. A method for use in packing meat cuts, including:

acquiring information relating to one or more characteristics of individual meat cuts as the meat cuts are conveyed past a meat cut information acquisition stage, and

at a subsequent diversion stage in a conveyor system directing each of the individual meat cuts to one of two or more alternative packing stations based on the information relating to individual meat cuts acquired at the meat cut acquisition stage.

28. A method according to claim 27 including dispensing or applying to meat cuts at one or more packing station(s) one or more size(s) or type(s) of pack and dispensing at one or more other packing station(s) one or more other size(s) or type(s) of pack.
29. A method according to claim 27 including receiving at each packing station acquired information relating to individual meat cuts as they leave the meat cut information acquisition stage or more between or arrive at the packing station, or instructions associated with individual meat cuts from a control system, and dispensing or applying a pack matched to each individual meat cut arriving at the packing station.
30. A method according to claim 29 including dispensing or applying at one or more packing station(s) one or more larger packs and at one or more other packing station(s) one or more smaller packs.
31. A method according to claim 30 including dispensing or applying at one or more packing station(s) plastic packs of greater width and dispensing or applying at one or more other packing station(s) plastic packs of lesser width.
32. A method according to either one of claims 27 to 30 including manufacturing and dispensing or applying at one or more packing stations plastic packs in different lengths from packing material stock based on information relating to individual meat cuts acquired at the meat cut information acquisition stage.
33. A method for matching meat cuts and packs for meat cuts, including:  
  
acquiring with a machine vision system information relating to one or more of the dimensions, volume, shape, cut type, or meat quality or grading of the individual meat cuts, and

directing each of the individual meat cuts to one or more of a number of parallel meat cut packing stations arranged to automatically pack the meat cuts in a different size or type of pack from one or more other packing stations, or arranged to deliver to an operator for manual packing of the meat cuts a pack of a different size or type from that dispensed by one or more other of the packing stations.

34. A method according to any one of claims 27 to 33 including printing on packs dispensed for or applied to individual meat cuts as they arrive at the packing station information indicative of one or more of meat cut weight, cut type, a processing or other date, carcass identification information, or other information relating to the meat cuts.
35. A bagging apparatus for use in placing meat cuts in bags, including a conveyor on which a meat cut is supported while a bag is placed over the meat cut and either means arranged to detect when the meat cut is in the bag and arrange to then activate the conveyor to move the meat cut and bag from the bagging apparatus, or means which may be manually activated via the bag by an operator to activate the conveyor to move the meat cut and bag from the bagging apparatus.
36. Apparatus according to claim 35 wherein a switch or proximity sensor is arranged to be activated by contact of a bag with a trigger mechanism when the bag is placed over the meat cut..

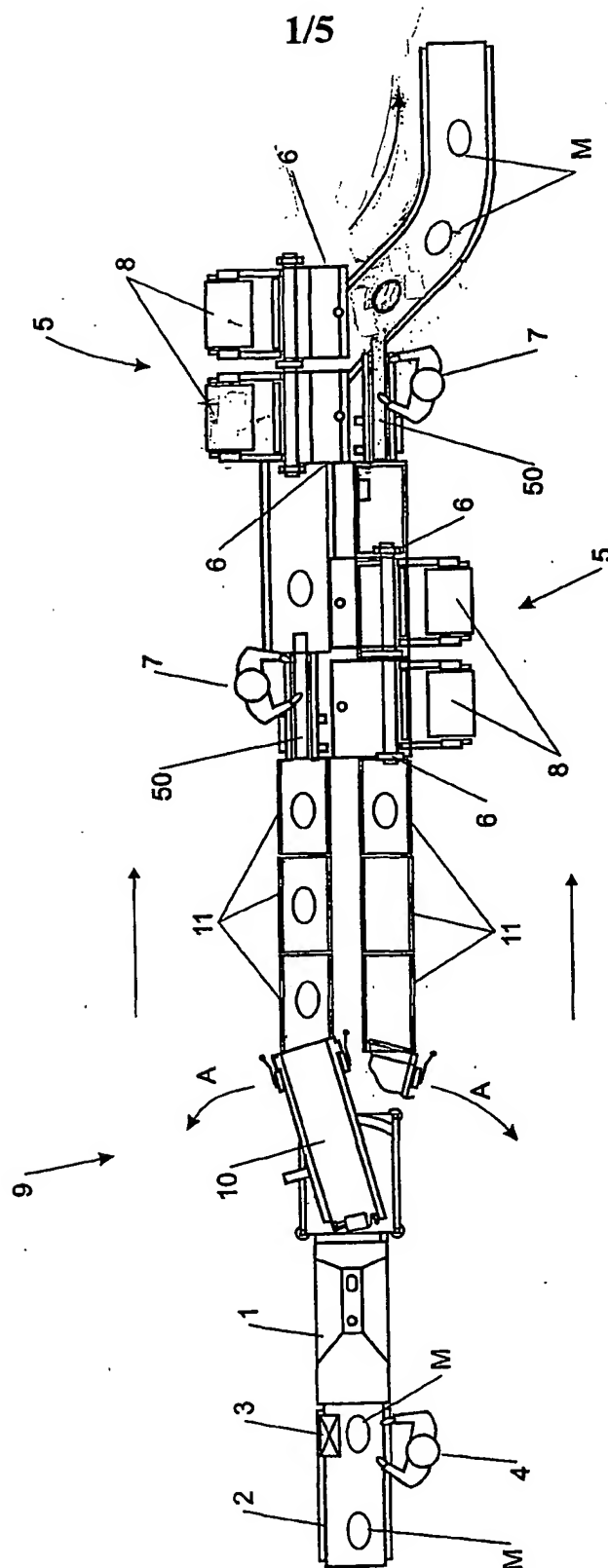


FIGURE 1

2/5

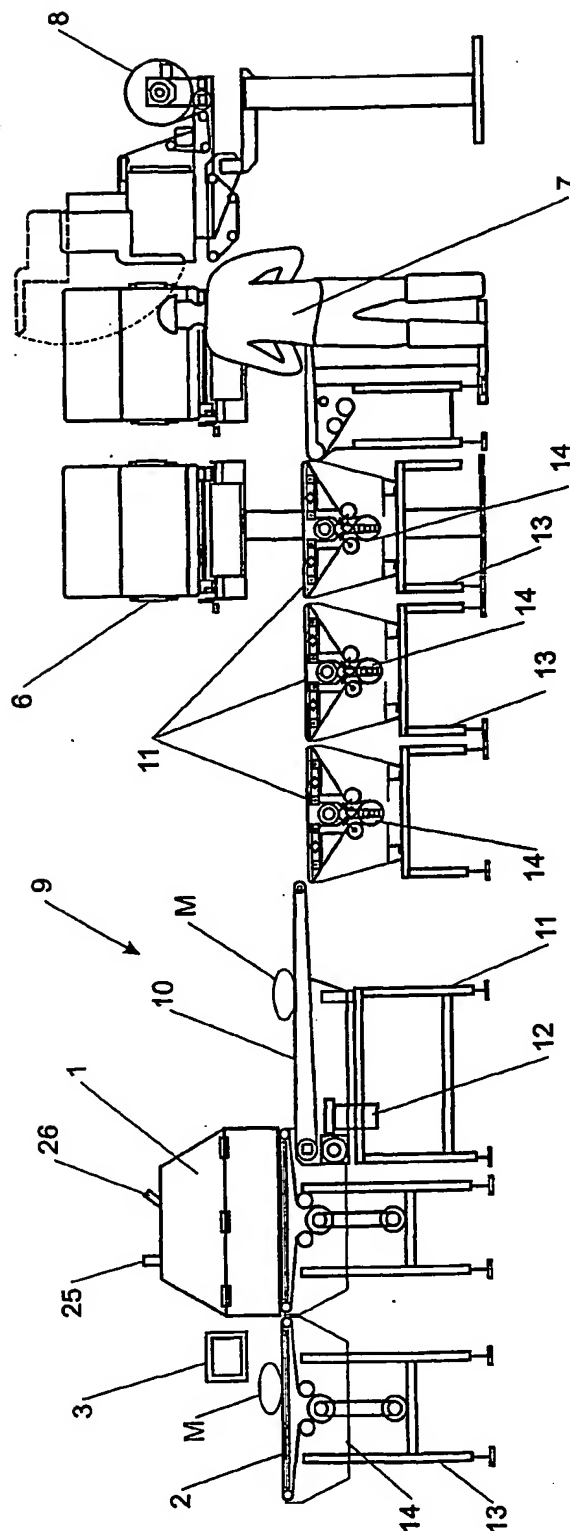


FIGURE 2

3/5

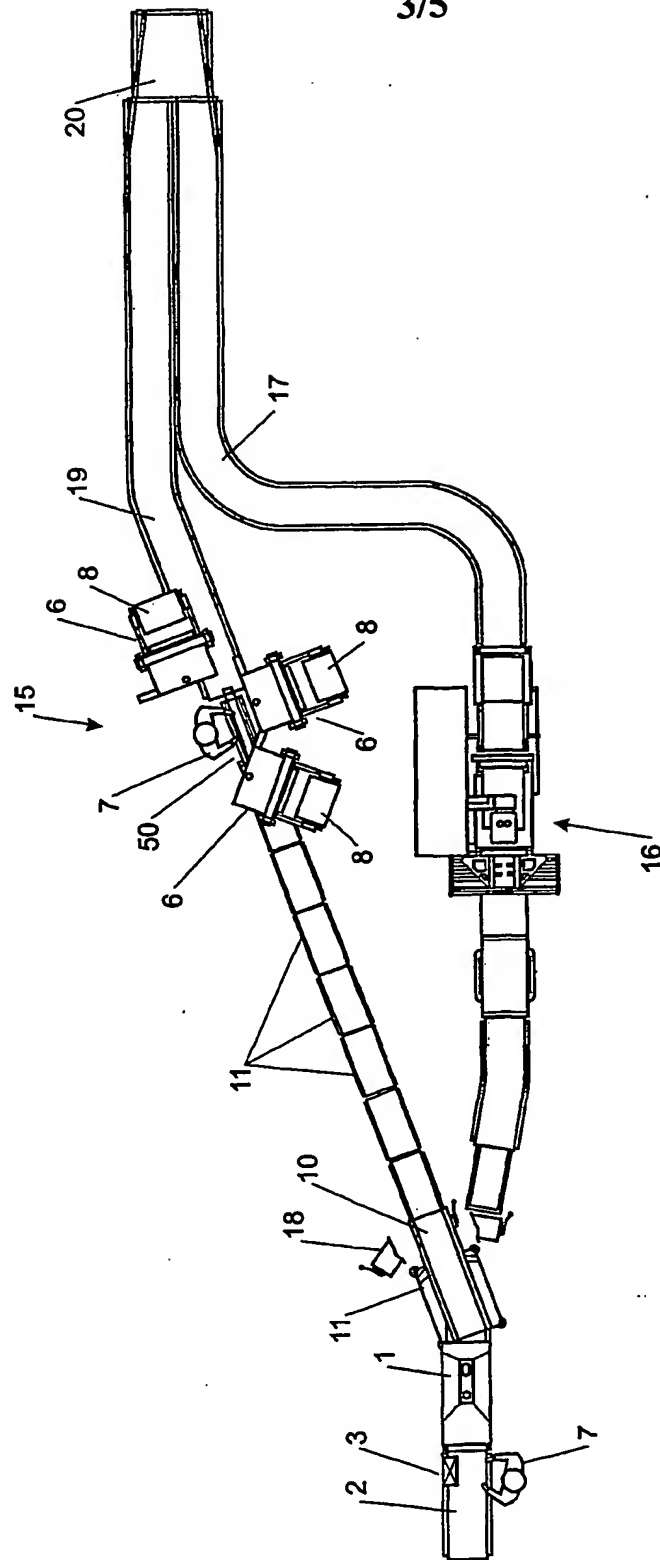


FIGURE 3



4/5

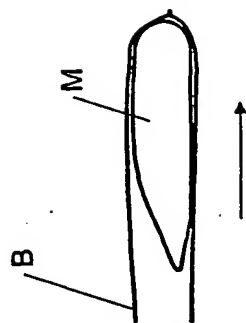


FIGURE 4C

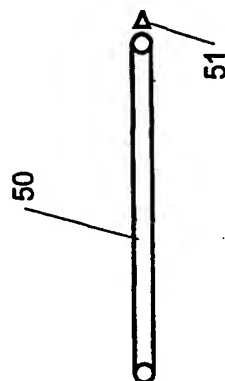


FIGURE 4B

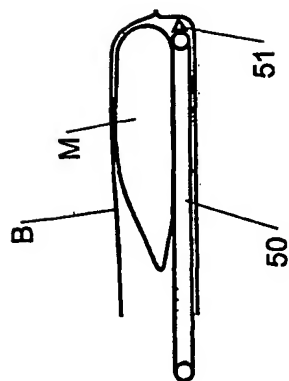
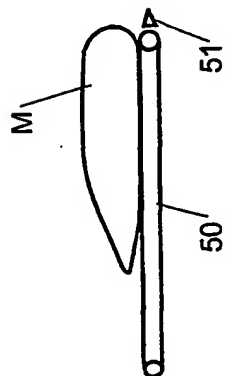
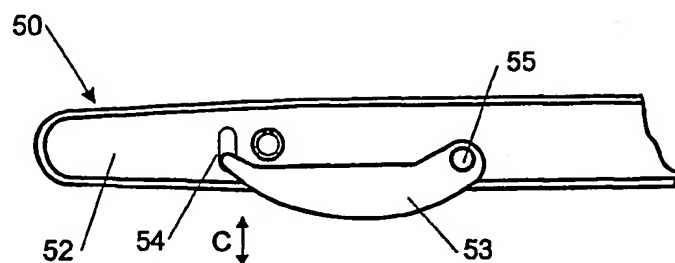


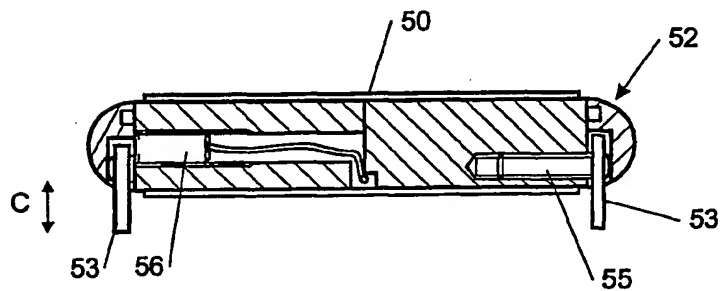
FIGURE 4A



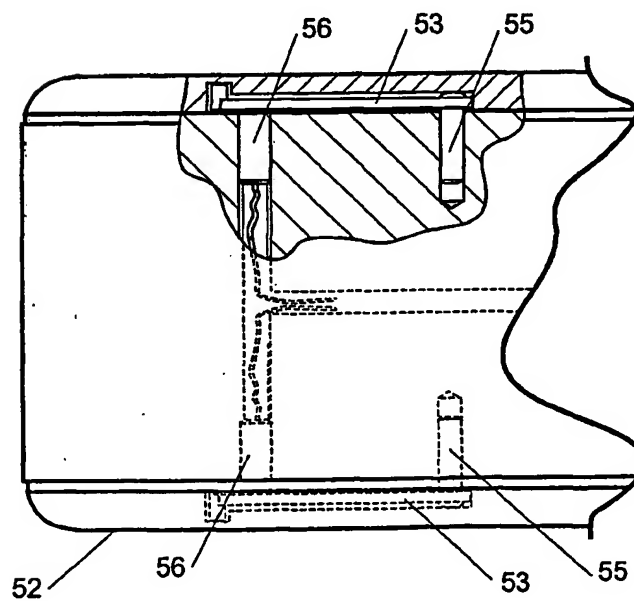
5/5



**FIGURE 5**



**FIGURE 6**



**FIGURE 7**

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ01/00169

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>		
Int. Cl. <sup>7</sup> : B65B 59/00, 25/06, 57/10, 35/24		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols) REFER TO ELECTRONIC DATABASE CONSULTED BELOW		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) DWPI:IPC G01N 5/00, 33/12, G01B 11/-, 21/-, B65B 25/-, 59/-, B65D 85/00 & keywords: (meat, chops, size, information, divert, station, process, bag, scan) and similar terms DWPI: IPC B65B, B65G, B65D 30/-, 85/-, G01N 33/12 & keywords: (bag, package, convey, detect, sense, switch, trigger, activate, load, fill, enter) and similar terms		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 89212 B (K. K. ISHIDA KOKI SEISAKUSHO) 21 September 1983 Page 2, line 1-page 3, line 5	1, 10, 11, 13, 24, 27, 33
X	WO 89/06782 A (EMVE I ASTORP AB) 27 July 1989 Abstract	1, 10, 11, 13, 24, 27, 33
A	GB 2285126 A (NEWMAN) 28 June 1995 Abstract	1
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C <input checked="" type="checkbox"/> See patent family annex		
<p>* Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&amp;" document member of the same patent family</p>		
Date of the actual completion of the international search 31 January 2002		Date of mailing of the international search report - 7 FEB 2002
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaaustralia.gov.au Facsimile No. (02) 6285 3929		Authorized officer  JAGDISH WABLE Telephone No : (02) 6283 2638

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ01/00169

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 98/00338 A (SEALED AIR (NZ) LIMITED) 8 January 1998 Abstract	1, 24, 27, 33
A	WO 89/12397 A (LUMETECH A/S) 28 December 1989 Abstract	1, 24, 27, 33
X	US 4219989 A (ANDREWS) 2 September 1980 See whole document - Trigger or hocking plate (161)	35, 36
X	US 3872644 A (GIRAUDI et al) 25 March 1975 See whole document - particularly column 8 and switch plates	35, 36
X	US 5685129 A (BAKER) 11 November 1997 See whole document - Eg column 6, lines 19 to 26 and figure 2	35, 36
X	JP 09-66906 A (FUJI KIKAI KK) 11 March 1997 See whole document - Sensors (SW)	35, 36
X	US 5782056 A (MAY et al) 21 July 1998 See whole document	35, 36
X	US 5483786 A (GIESBRECHT et al.) 16 January 1996 See whole document	35, 36

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ01/00169

**Box I** Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos :  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos :  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos :  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

**Box II** Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See extra sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:1-34

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ01/00169

**Supplemental Box**

(To be used when the space in any of Boxes I to VIII is not sufficient)

**Continuation of Box No: II**

The international application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept. In coming to this conclusion the International Searching Authority has found that there are different inventions as follows:

1. Claims 1-34 relate to an apparatus and a method for packing meat cuts. It is considered that a diversion stage between meat cut information acquisition stage and the meat cut packing stations comprises a first "special technical feature".
2. Claims 35 and 36 relate to a bagging apparatus for use in placing meat cuts in bags. It is considered that the means to activate the conveyor to move the meat cut and bag from the bagging apparatus comprises a second "special technical feature".

Since the abovementioned groups of claims do not share any of the technical features identified, a "technical relationship" between the inventions, as defined in PCT rule 13.2 does not exist. Accordingly the international application does not relate to one invention or to a single inventive concept, a priori.

INTERNATIONAL SEARCH REPORT  
Information on patent family members

International application No.  
PCT/NZ01/00169

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report			Patent Family Member		
EP	89212	JP 68156805	US 4693378	US 4818380	
		JP 58156806	JP 58156382	JP 58156381	
		JP 58158762			
WO	8906782	DK 1591/90	GB 2232765	NL 8920012	
		NO 903101	SE 8800074		
GB	2285126	NONE			
WO	9800338	AU 32788/97	NZ 286910	NZ 330064	
WO	8912397	CA 1333928	DK 3440/88	EP 429465	
		US 5241365			
US	4219989	CA 1104975	US 4432188	US 4352263	
US	3872644	NONE			
US	5685129	NONE			
JP	0966906	NONE			
US	5782056	AU 16866/95	BR 9506630	CA 2180955	
		EP 737150	WO 9519293	US 5570561	
US	5483786	AU 68396/94	EP 700351	WO 9427867	
					END OF ANNEX